Attorney Docket No. 2000.180 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Sengupta, et al

Art Unit: 1797

Serial No. 10/812,450

Examiner: Menon, Krishnan S.

Filed: March 30, 2004

For: THREE PORT HIGH PERFORMANCE MINI HOLLOW FIBER MEMBRANE CONTACTOR

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AMENDED APPEAL BRIEF 37 CFR § 41.37

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Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Amended Appeal Brief is being filed in response to the Notification of Non-Compliant Appeal Brief dated April 18, 2008. The Appeal Brief has been corrected on Page 3, Section III. STATUS OF THE CLAIMS to indicate that claims 19-22 are the subject of this appeal.

Table of Contents

I. REAL PARTY IN INTEREST

The real party in interest is Celgard Inc., the assignee of record in the instant application.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF THE CLAIMS

Claims 1-14 were originally filed in this case. Claims 2 and 9 have been cancelled. Claims 1, 3, 7, 8, 10 and 14 have been amended. Claims 15-22 have been added. Added claims 19-22 have been amended.

Claims 1, 3-8 and 10-22 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,616,841 ("Cho") in view of US Patent No. 4,623,460 ("Kuzumoto") or alternatively over Kuzumoto in view of Cho. Claims 1, 3-8 and 10-22 also stand rejected under 35 U.S.C. 103(a) as being obvious over US Patent Publication No. 2003/0154856 ("Anderson") in view of Cho, or in the alternative Cho in view of Anderson.

Accordingly, claims 1, 3-8 and 10-22 are the subject of this Appeal.

IV. STATUS OF AMENDMENTS

No claim was amended after the Final Rejection and prior to this Appeal which is the subject of this appeal.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The following is a concise explanation of the subject matter defined in independent Claims 19, 1, 20, 7, 21, 8, 22 and 14.

According to Claim 19, the instant invention is a hollow fiber membrane contactor (Paragraph 7 and Figure 1) which comprises: a cartridge (Paragraphs 18-24 and Figure 3) comprising: a perforated center tube having a first end and a second end (Paragraph 19 and Figures 1 and 3-4); a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube (Paragraphs 20-21 and Figures 1 and 3-4), a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends (Paragraph 23 and Figures 1 and 3-4), a plug located at said first tube sheet (Paragraph 24 and Figures 1 and 3-4), said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet (Paragraph 7 and Figures 1 and 3-4); a shell having two ends and an opening, and being adapted for enclosing said cartridge (Paragraph 17 and Figures 1, 2 and 4), said tube sheets being sealed to said shell

(Paragraph 25 and Figures 1 and 4); a first end cap having an opening therethrough (Paragraph 7 and Figure 1), said first end cap being adjoined to said first end of said shell (Paragraph 13 and Figure 1) where said first end cap and said first tube sheet defining a first head space therebetween (Paragraph 7 and Figure 1), said first end cap opening being in communication with said hollow fiber lumens via said first head space (Paragraph 14 and Figure 1); a second end cap having an opening therethrough (Paragraph 7 and Figure 1), said second end cap being adjoined to said second end of said shell (Paragraph 13 and Figure 1) where said second end cap and said second tube sheet defining a second headspace therebetween (Paragraph 14 and Figure 1), said second end cap opening being in communication with said center tube via said second headspace (Paragraph 14 and Figure 1); wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening, and a vacuum being applied via said first end cap opening (Paragraphs 14-16 and Figure 1).

Claim 1 of the instant invention includes all the elements from claim 21 above and further includes the element of said shell (Paragraph 17), said first end cap (Paragraph 34), said second end cap (Paragraph 34), said center tube (Paragraph 19), said first

tube sheet (Paragraph 23), said second tube sheet (Paragraph 23), and said plug are made from a same material (Paragraph 24).

According to Claim 20, the instant invention is a system for degassing a liquid (Paragraphs 14-16) comprising: a liquid under an elevated pressure (Paragraphs 14-16); a hollow fiber membrane contactor (Paragraph 7 and Figure 1) comprising: a cartridge (Paragraphs 18-24 and Figure 3) comprising: a perforated center tube having a first end and a second end (Paragraph 19 and Figures 1 and 3-4), a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube (Paragraphs 20-21 and Figures 1 and 3-4), a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends (Paragraph 23 and Figures 1 and 3-4), a plug located at said first tube sheet (Paragraph 24 and Figures 1 and 3-4), said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet (Paragraph 7 and Figures 1 and 3-4); a shell having two ends and an opening and being adapted to enclose said cartridge (Paragraph 17 and Figures 1, 2 and 4); said tube sheets being sealed to said shell (Paragraph 25 and Figures 1 and 4); a first end cap having an opening therethrough (Paragraph 7 and Figure 1); said first end cap being adjoined to said first end of said shell (Paragraph 13 and Figure

1) where said first end cap and said first tube sheet defining a first head space therebetween (Paragraph 7 and Figure 1); said first end cap opening being in communication with said hollow fiber lumens via said first head space (Paragraph 14 and Figure 1); a second end cap having an opening therethrough (Paragraph 7 and Figure 1); said second end cap being adjoined to said second end of said shell (Paragraph 13 and Figure 1) where said second end cap and said second tube sheet defining a second head space therebetween (Paragraph 14 and Figure 1); said second end cap opening being in communication with said center tube via said second head space (Paragraph 14 and Figure 1); wherein said fluid under the elevated pressure being introduced to said contactor via said second end cap opening, said fluid under the elevated pressure being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening (Paragraphs 14-16 and Figure 1).

Claim 7 of the instant invention includes all the elements from claim 21 above and further includes the element of said shell (Paragraph 17), said first end cap (Paragraph 34), said second end cap (Paragraph 34), said center tube (Paragraph 19), said first tube sheet (Paragraph 23), said second tube sheet (Paragraph 23), and said plug are made from a same material (Paragraph 24).

According to Claim 21, the instant invention is a hollow fiber membrane contactor (Paragraph 7 and Figure 1) which comprises: a cartridge (Paragraphs 18-24 and Figure 3) comprising: a perforated center tube having two ends (Paragraph 19 and Figures 1 and 3-4); a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes, said hollow fiber membranes having a lumen (Paragraphs 20-21 and Figures 1 and 3-4); tube sheets affixing said fabric to said tube at each said tube end (Paragraph 23 and Figures 1 and 3-4); and a plug located at one end of said tube (Paragraph 24 and Figures 1 and 3-4); wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet (Paragraph 7 and Figures 1 and 3-4); a shell having two ends and an opening, said shell being adapted to enclose said cartridge (Paragraph 17 and Figures 1, 2 and 4); said tube sheets being sealed to said shell (Paragraph 25 and Figures 1 and 4); end caps having an opening therethrough (Paragraph 7 and Figure 1); said end caps being adjoined to said shell ends (Paragraph 13 and Figure 1); wherein one of said end caps and said tube sheet next to said plug defining a first head space therebetween (Paragraph 7 and Figure 1) where said end cap opening being in communication with said hollow fiber lumens via said first head space (Paragraph 14 and Figure 1); wherein said other end cap and said other tube sheet defining a second head space therebetween (Paragraph 14 and Figure 1) where

said end cap opening being in communication with said center tube via said second headspace (Paragraph 14 and Figure 1); wherein fluid introduced into said contactor via said opening in communication with said center tube being distributed across said hollow fiber fabric and exiting said contactor via said opening through said shell, and a vacuum being applied via said opening in communication with said hollow fiber lumens (Paragraphs 14-16 and Figure 1).

Claim 8 of the instant invention includes all the elements from claim 21 above and further includes the element of said shell (Paragraph 17), said first end cap (Paragraph 34), said second end cap (Paragraph 34), said center tube (Paragraph 19), said first tube sheet (Paragraph 23), said second tube sheet (Paragraph 23), and said plug are made from a same material (Paragraph 24).

According to Claim 22, the instant invention is a system for introducing a gas into a liquid (Paragraphs 14-16) comprising: a liquid (Paragraphs 14-16); a gas under an elevated pressure (Paragraphs 14-16); a hollow fiber membrane contactor (Paragraph 7 and Figure 1) comprising: a cartridge (Paragraphs 18-24 and Figure 3) comprising: a perforated center tube having two ends (Paragraph 19 and Figures 1 and 3-4); a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes,

said hollow fiber membranes having a lumen (Paragraphs 20-21 and Figures 1 and 3-4); tube sheets affixing said fabric to said tube at each said tube end (Paragraph 23 and Figures 1 and 3-4); and a plug located at one end of said tube (Paragraph 24 and Figures 1 and 3-4); wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet (Paragraph 7 and Figures 1 and 3-4); a shell having two ends and an opening, said shell being adapted to enclose said cartridge (Paragraph 17 and Figures 1, 2 and 4); said tube sheets being sealed to said shell (Paragraph 25 and Figures 1 and 4); end caps having an opening therethrough (Paragraph 7 and Figure 1); said end caps being adjoined to said shell ends (Paragraph 13 and Figure 1); wherein one of said end caps and said tube sheet next to said plug defining a first head space therebetween (Paragraph 7 and Figure 1) where said end cap opening being in communication with said hollow fiber lumens via said first head space (Paragraph 14 and Figure 1); wherein said other end cap and said other tube sheet defining a second head space therebetween (Paragraph 14 and Figure 1) where said end cap opening being in communication with said center tube via said second headspace (Paragraph 14 and Figure 1); wherein said gas under the elevated pressure being introduced into said hollow fiber lumens via said first end cap opening, and simultaneously said fluid being introduced to said contactor via said second end cap opening, said fluid being distributed across

said hollow fiber fabric, said fluid then exiting said contactor via said shell opening (Paragraphs 14-16 and Figure 1).

Claim 14 of the instant invention includes all the elements from claim 21 above and further includes the element of said shell (Paragraph 17), said first end cap (Paragraph 34), said second end cap (Paragraph 34), said center tube (Paragraph 19), said first tube sheet (Paragraph 23), said second tube sheet (Paragraph 23), and said plug are made from a same material (Paragraph 24).

VI. GROUND'S OF REJECTION TO BE REVIEWED ON APPEAL

A. 35 U.S.C. §103(a) over Kuzumoto and Cho

Claims 1, 3-8 and 10-22 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,616,841 ("Cho") in view of US Patent No. 4,623,460 ("Kuzumoto") or alternatively, Kuzumoto in view of Cho.

B. 35 U.S.C. §103(a) over Anderson and Cho

Claims 1, 3-8 and 10-22 also stand rejected under 35 U.S.C. 103(a) as being obvious over US Patent Publication No. 2003/0154856 ("Anderson") in view of Cho or alternatively, Cho in view of Anderson.

Independent claims 19, 20, 21 and 22 stand or fall together under 35 U.S.C. § 103(a).

Independent claims 1, 7, 8 and 14 stand or fall together under 35 U.S.C. § 103(a) but should be ruled upon separately from independent claims 19, 20, 21 and 22 as they include an additional element.

Claims 3-6 depend from claim 1; thus, the allowance of claims 3-6 depend from the allowance of claim 1. As a result, claims 1 and 3-6 stand or fall together.

Claims 10-13 depend from claim 8; thus, the allowance of claims 10-13 depend from the allowance of claim 8. As a result, claims 8 and 10-13 stand or fall together.

VII. ARGUMENT

Claims 1, 3-8 and 10-22, for the reasons explained hereinafter, are not obvious under 35 U.S.C. § 103(a); thus, the above-mentioned 103 rejections are improper, and they must be removed.

THE INVENTION

The invention is directed to a three-port high performance mini hollow fiber membrane contactor. The three-port hollow fiber membrane contactor is a simple configuration of a membrane contactor that is easily manufactured. The instant configuration includes a cartridge, a shell, a first end cap, and a second end cap. The shell encloses the cartridge and has an opening. The cartridge includes a perforated center tube, a hollow fiber fabric, a first tube sheet, a second tube sheet, and a plug. The perforated center tube has a first end and a second end, and the hollow fiber fabric surrounds the center tube. A first tube sheet

and a second tube sheet affix the hollow fiber fabric to the center tube at each end of the center tube, and the plug is located at the first tube sheet. The hollow fiber membranes are open at the first tube sheet and the hollow fiber membranes are closed at the second tube sheet. The first end cap and the first tube sheet define a first headspace therebetween. The first end cap has an opening therethrough, which is in communication with the hollow fiber lumens via the first headspace. The second end cap and the second tube sheet define a second headspace therebetween. The second end cap has an opening which is in communication with the center tube via the second headspace.

This configuration of a hollow fiber membrane is non-obvious under 35 U.S.C. § 103 because none of the prior art references (Kuzumoto, Cho and Anderson) teach, suggest or provide a "reason"[1] for providing a membrane contactor with the above described configuration. The lack of a teaching, suggestion or reason is embodied by the fact that none of the prior art references teach or suggest providing a configuration of a membrane contactor that allows for both of the end caps to be sealed or attached to the membrane contactor at a single location. The instant configuration of a membrane contactor has end caps that are each sealed to the

[1] In the most recent Supreme Court ruling on obviousness, KSR. v. Teleflex, the court addressed the teaching, suggestion, motivation standard issue by stating it is important to find a "reason" for combining the prior art. *KSR International Co. v. Teleflex Inc.*, 550 US _____ , at 15(2007).

membrane contactor at a single seal location of the end of the shell, making the contactor more easy to manufacture. See Annotated Figure 1 below.

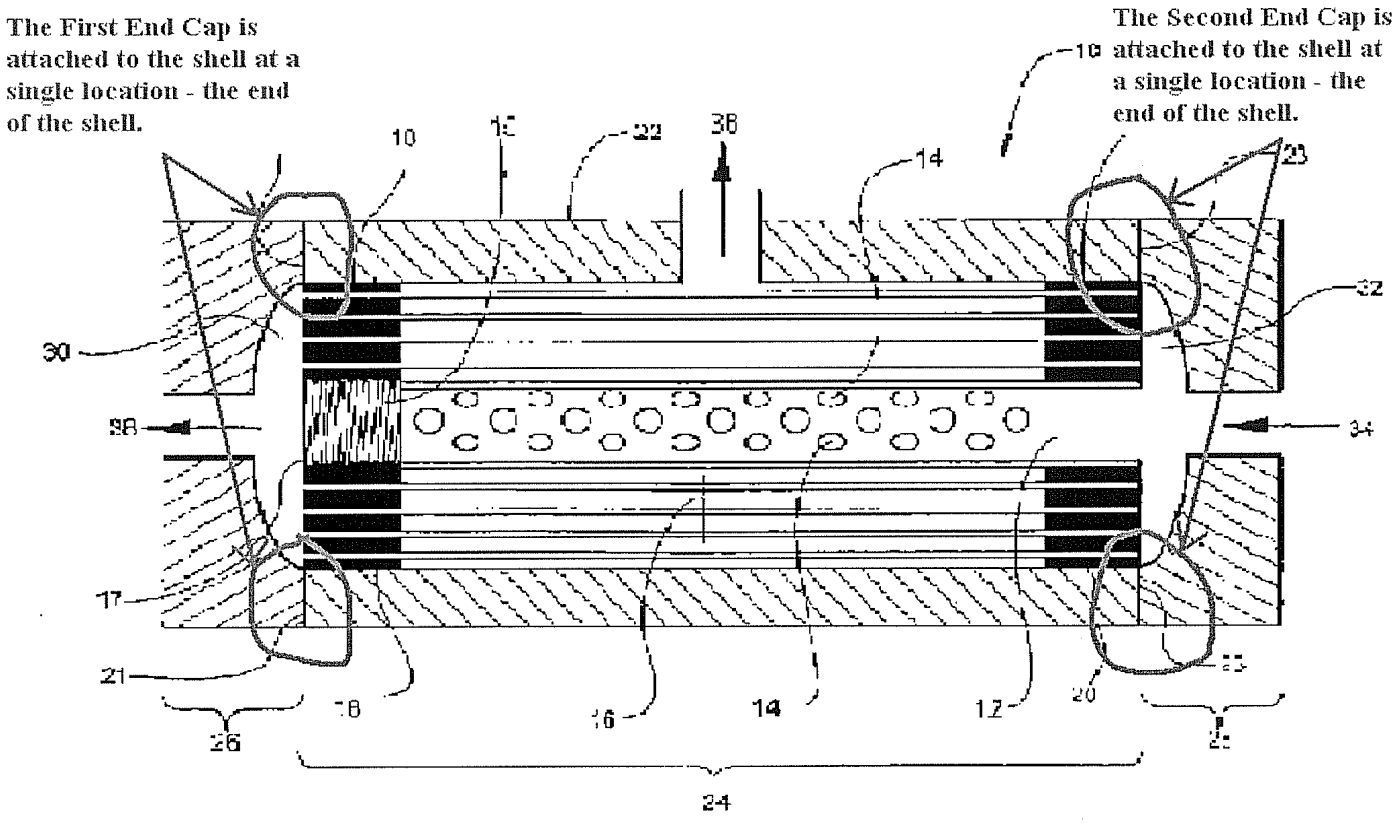


Fig. 1

As shown above, both of the end caps of the instant invention are sealed or attached at a single location, the shell ends. Previous configurations of membrane contactors (including Kuzumoto, Cho, and Anderson, as discussed in more detail below) require at least one of the end caps to be attached to the membrane contactor at two or more locations, i.e., the shell wall/end and the center tube, the tube sheets and the center tube, etc. Attaching an end cap at two or more locations, or dual welding the end cap to the membrane contactor is a very difficult manufacturing step. See

Exhibit 1, Declaration of Amitava Sengupta. Thus, the instant configuration of a membrane contactor allows the membrane contactor to be produced more easily by eliminating the need to dual weld either of the end caps to the membrane contactor.

This aspect of the instant invention of eliminating the need to dual weld either of the end caps to the membrane contactor is allowed by the entire configuration of the membrane contactor as claimed. However, for purposes of this appeal, the applicant will focus on one aspect of this configuration of a membrane contactor which permits the membrane contactor to be made without dual welding either end cap. Namely, the applicant will focus on the second headspace defined by the second end cap and the second tube sheet[2]. This second headspace, which is associated with the closed ends of the hollow fibers, forces the opening in the second end cap to communicate with the center tube via the second headspace. Nowhere in the prior art is there a teaching, suggestion or reason for providing a second headspace that forces the opening in an end cap that needs to communicate with the center tube to communicate with the center tube via a headspace. All end caps in the prior art teach the opening in the end cap that needs to communicate with the center tube to communicate directly with the center tube. This

[2] The first end cap does not communicate with the center tube, thus, the first end cap does not have to be sealed at two locations (i.e., the center tube and the shell ends).

aspect of the prior art requires the end cap that needs to communicate with the center tube to be sealed or connected to the center tube forcing the end cap to be sealed at two locations, i.e., the shell end/wall and the center tube. Thus, the instant configuration of a membrane contactor with a second headspace that forces the end cap to communicate with the center tube via the headspace is what allows the second end cap to be attached to the membrane contactor at a single location[3].

In sum, the instant configuration of a membrane contactor with a second headspace for forcing the opening in the second end cap to communicate with the center tube via the second headspace is non-obvious because there is no teaching, suggestion, or "reason" for providing the second headspace and the second headspace results in allowing the membrane contactor to be made more easily by eliminating the need to dual weld either of the end caps to the membrane contactor.

[3] Although the applicant is focusing on the second headspace for purposes of this appeal, the entire configuration of the membrane contactor is the invention as claimed. The configuration as claimed (i.e. the configuration of the shell, tube sheets, end caps, headspaces, hollow fiber membranes, etc.) are what allows for the membrane contactor to be functional while having a second headspace that forces the opening through the second end cap to communicate with the center tube via the headspace. For instance, in order to provide a second headspace as claimed, the center tube must be open at the same end where the hollow fiber lumens are closed. None of the prior art references show a configuration of a membrane contactor that would be functional with a second headspace that forces the opening through the second end cap to communicate with the center tube via the headspace because none of the prior art references show a headspace where the center tube is open at the same end where the hollow fiber lumens are closed. Thus, none of the prior art references allows the end caps to be sealed or attached to the membrane contactor at a single location.

A) CLAIMS 1, 3-8 AND 10-22 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a) OVER CHO IN VIEW OF KUZUMOTO OR KUZUMOTO IN VIEW OF CHO

Applicant contends that the combination of Kuzumoto in view of Cho or Cho in view of Kuzumoto does not teach, suggest or provide a "reason" for making a membrane contactor with a second headspace as in the instant invention as claimed in all of the independent claims. More specifically, Kuzumoto and Cho do not teach, suggest or provide a "reason" for making a membrane contactor with a second headspace defined by the second end cap and the second tube sheet (with the closed ends of the hollow fibers) that forces the opening through the end cap to communicate with the center tube via the second headspace. Furthermore, applicant contends that this second headspace is non-obvious because it results in allowing the membrane contactor to be made more easily by eliminating the need to dual weld the end caps to the contactor.

THE QUESTION BEFORE THE BOARD

The only real question before the board is whether the combination of Cho and Kuzumoto teaches, suggests or provides a "reason" for providing a membrane contactor as claimed in independent claims 1, 7, 8, 14 and 19-22.

DISCUSSION OF THE EXAMINER'S ERROR

MPEP § 2143 "Basic Requirements of a *Prima Facie* Case of Obviousness" states:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine references teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations.

Regarding the third criterion, the court has stated that "to establish *prima facie* obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Applicant contends that none of the prior art references, Cho nor, Kuzumoto, alone or in combination, teach, suggest or provide a "reason" for making a membrane contactor with all of the claim elements from independent claims 1, 7, 8, 14 and 19-22. More specifically, applicant contends that none of the prior art references, alone or in combination, teach, suggest or provide a "reason" for making a membrane contactor comprising, among other things, where "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end

cap opening being in communication with said center tube **via said second head space.**"

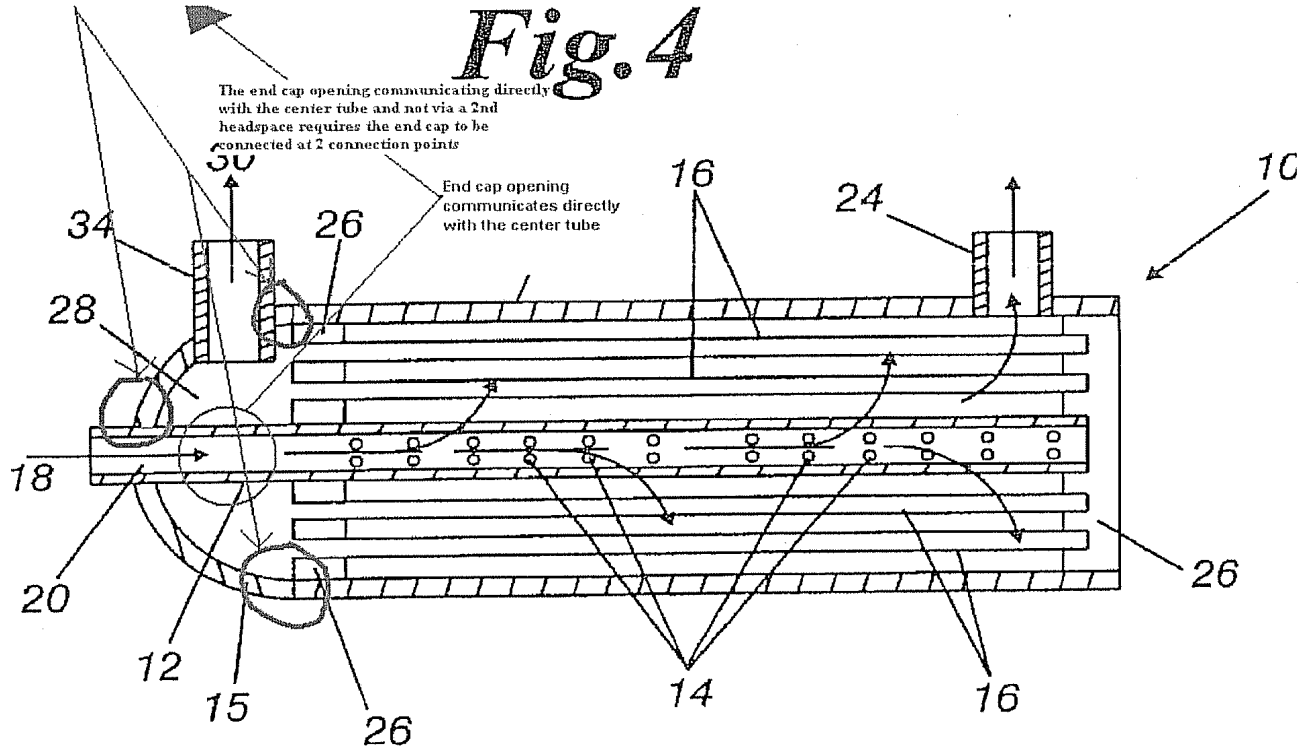
In other words, Cho nor Kuzumoto teach, suggest or provide a "reason" of making a membrane contactor that has a head space defined by an end cap and a tube sheet that forces the opening in the end cap to communicate with the center tube **via the headspace.** Accordingly, at issue is whether the prior art references teach, suggest or provide a "reason" for making an end cap that communicates with the center tube **via a headspace.** As shown below, the prior art references teach end caps that communicate directly with the center tube and not **via a headspace**, thus, requiring the end caps to be sealed at two locations which requires a dual welding step. See Exhibit 1, Sengupta Declaration

The Examiner has relied on the teachings of Cho as presented in Figure 4 for making his obviousness rejection. Cho, as shown in Figure 4 (see the below Figure), teaches a membrane contactor with only one end cap (15). End cap (15) has two openings, opening (20) and opening (34) (please note that all end caps taught by Cho, unlike the instant invention, have two openings). Liquid enters center tube (12) directly through opening (20). Column 4, Lines 52-53. As a result, the opening through end cap (15) does not communicate with the center tube via a headspace. This forces end

cap (15) to be sealed to the contactor at two locations, the end of shell (13) and center tube (12). These two seal locations require a dual welding step which is very difficult to accomplish (see Exhibit 1, Sengupta Declaration). This dual welding step is required in order to provide headspace (28), which allows a vacuum on the open ends of the fibers. Column 4, Lines 48-50.

See below an annotated Figure 4 of Cho that illustrates how the end caps of Cho communicate directly with the center tube and not **via a headspace**, thus, requiring the end caps to be sealed to the module at two locations.

2 seal locations - shell end and center tube



As a result, Cho does not teach, suggest or provide a reason for making a headspace defined by the end cap and the tube sheet that forces the opening of the end cap to communicate with the center tube **via the headspace**.

With regard to Cho, the Examiner stated in the latest office action, that:

> [t]he core is plugged on one end by the tube sheet (26), but is not the same end as claimed, which eliminates the "first" end cap in the reference figure 4. However, this difference in the claims is only an obvious equivalent of the teaching of the reference unless the applicant can show otherwise, with evidence. An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. Page 2, Lines 17-22.

Thus, the Examiner is stating that adding a second end cap to the right side of Cho would be within one skilled of the art. Applicant does not disagree. The end cap taught in Cho is clearly <u>not</u> equivalent to the second end cap of the instant invention as there is no second headspace that forces the opening in the end cap to communicate with the center tube **via a headspace**. Accordingly, if Cho were to add another end cap to the other end, there is no suggestion, teaching or "reason" that the opening in the added end cap should communicate with the center tube **via a headspace**. Thus, the Examiner has not addressed adding an end cap that defines a headspace between the end cap and the tube sheet that forces the

opening of the end cap to communicate with the center tube **via the headspace**, as claimed by the instant invention. Therefore, the suggested obviousness combination by the Examiner is not a mere reversal of parts, as the Examiner has asserted, but would require a substantial reconstruction and redesign of the end cap of Cho, which is clearly not permissible because there is no suggestion, teaching or "reason" for doing so. See *In re Ratti*, 270 F.2d 810 at 813 (CCPA 1959).

The Examiner stated, in the Final Office Action, that Cho teaches, in Figure 4, where the membrane lumen is open only on one end, "but is not the same end as claimed, but eliminates the 'first' end cap in the reference in Figure 4." The Examiner further stated that "this difference in the claims is only an obvious equivalent of the teaching of the reference unless applicant can show otherwise, with evidence." Applicant respectfully disagrees with this statement.

First, the examiner, (not the applicant, as the Examiner has requested) bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. MPEP § 2142. Furthermore, the Courts have held that "particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed

invention, would have selected these components for combination in the manner claimed," *In re Rouffet,* 149 F.3d 1350 at 1357 (Fed. Cir. 1998), and that these findings must be "clear and particular." *In re Dembiczak*, 175 F.3d 994 at 999 (Fed. Cir. 1999). Accordingly, where is the clear and particular factual support for altering Figure 4 of Cho to obtain to the instant invention, that is to say, where are the clear and particular findings of why Cho should be altered to the configuration of the instant invention with a second headspace defined by a tube sheet and an end cap that forces the opening in the end cap to communicate with the center tube **via the headspace**? The Examiner has not come forward with any clear and particular findings and the claimed configuration is found only in the instant application.

Second, it appears that the Examiner is implying that because the difference in Figure 4 of Cho and the instant application is a simple difference, the simple difference is obvious. Regarding simple differences, the Courts have reasoned that the temptation to engage in impermissible hindsight is especially strong with seemingly simple mechanical inventions and even with simple differences, "combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight." *In re*

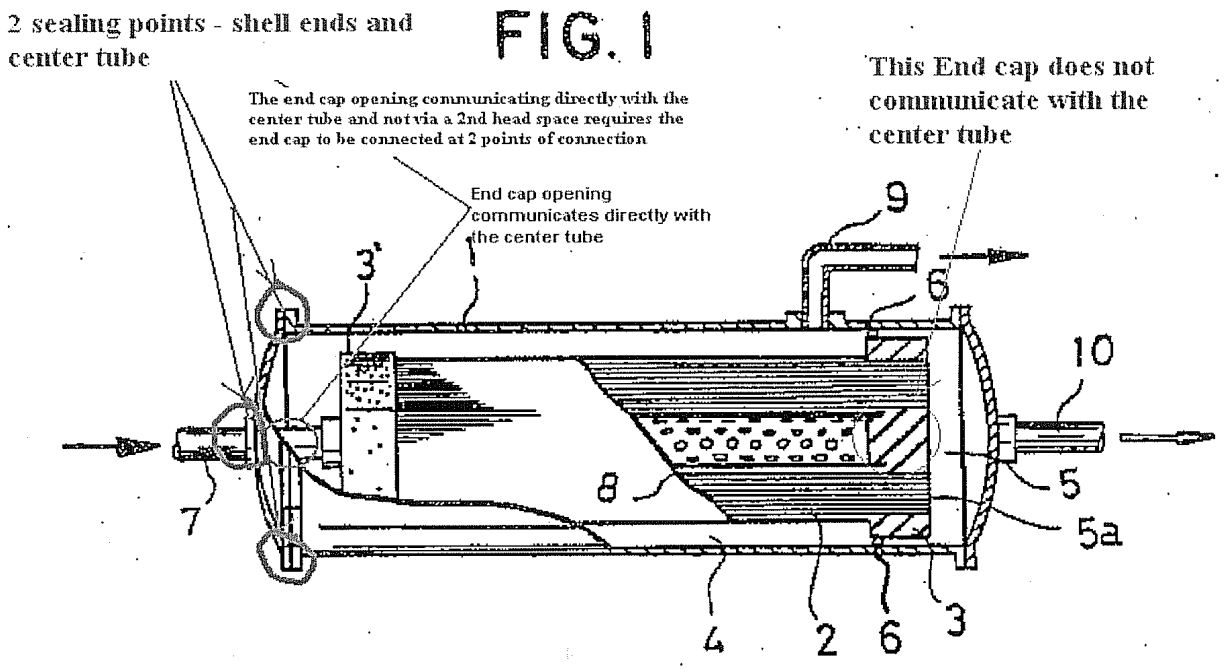
Dembiczak, 175 F.3d 994 at 999, (Fed. Cir. 1999). Thus, although the difference between Figure 4 of Cho and the instant application might be a simple difference, it is impermissible hindsight reconstruction to say the difference is obvious without evidence of a suggestion, teaching or "reason."

Thus, since it is not the Applicant's initial burden to come forward with evidence of nonobviousness, as the Examiner has requested, and since the Examiner has not shown any clear and particular factual support for why altering Figure 4 of Cho to get to the instant invention is obvious, the Examiner has not shown a *prima facie* case of obviousness with regard to the Cho reference.

Kuzumoto, as shown in Figure 1 (see the below annotated Figure), teaches a device with an end cap at each end of the device. At the end of the apparatus that communicates with the center pipe (8) (left side), an end cap is provided that has an inlet pipe (7). The opening through the end cap, or inlet pipe (7), communicates directly with the center pipe (8). Column 1, Lines 49-50. As a result, the end cap does not communicate with the inlet pipe via a headspace. This forces the end cap to be sealed to the apparatus at two locations, the end of casing (1) and the center pipe (8). These two sealing points require a dual

welding step that is very difficult to accomplish (see Exhibit 1, Sengupta Declaration).

See below an annotated Figure 1 of Kuzumoto that illustrates how the end cap of Kuzumoto that communicates with the center tube communicates directly with the center tube and not **via a headspace**, thus, requiring the end cap to be sealed to the module at two locations.



As a result, the apparatus of Kuzumoto does not provide a headspace defined by the end cap and the tube sheet that forces the opening through the end cap to communicate with the center tube **via the headspace**.

Furthermore, the resin layer (3) of Kuzumoto is not sealed to the casing (1). This fact makes it impossible for Kuzumoto to provide a headspace defined by the end cap and the resin layer (3). Therefore, Kuzumoto can not teach, suggest, or provide a reason for a membrane contactor comprising, among other things, where "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end cap opening being in communication with said center tube **via said second head space.**"

Accordingly, Cho nor Kuzumoto, alone or in combination, teach, suggest, or provide a reason for making a membrane contactor with **all** the claim limitations from independent claims 1, 7, 8, 14 and 19-22, i.e., a headspace defined by an end cap and a tube sheet that forces the opening of the end cap to communicate with the center tube **via the headspace**.

Where is the teaching, suggestion or reason for providing this configuration of a membrane contactor? The answer, as shown above, is nowhere in the prior art. The answer can only be found in the instant application. Therefore, the Examiner has failed to present a *prima facie* case of obviousness and is merely using impermissible hindsight reconstruction.

In addition, assuming arguendo that the Examiner has made out a *prima facie* case of obviousness, Applicant submits Exhibit 1, the 132 Declaration by one of the named inventors, Amitava Sengupta, as evidence that the difference in the instant configuration, as claimed, is non-obvious. This configuration of a membrane contactor with a headspace defined by the end cap and the tube sheet that forces the opening of the end cap to communicate with the center tube **via the headspace**, is not obvious because it unexpectedly resulted in allowing the membrane contactor to be made more easily. See Exhibit 1, the Sengupta Declaration.

"Evidence of unexpected results must be weighted against evidence supporting *prima facie* obviousness in making a final determination of the obviousness of the claimed invention." *In re May*, 574 F.2d 1082, 197 USPQ 601 (CCPA 1978). Thus, in the instant invention, the Sengupta Declaration must be weighed in making a final determination of obviousness. In addition, the ultimate determination on patentability is made on the entire record, meaning, the secondary considerations of obviousness should be considered in view of any amendments. MPEP § 2141. Thus, in the instant invention, the Sengupta Declaration must be weighed against the current claims in making a final determination of obviousness.

The Sengupta Declaration shows that the instant configuration of a membrane contactor eliminates the need to dual weld the end cap at two seal points, the shell and the center tube. See the figures above which show that all of the prior art references require a dual welding step at two seal points, the shell and the center tube. Welding the end cap to the shell and the end cap to the center tube must be done by simultaneously welding the end cap to the shell and center tube (see Sengupta Declaration, Paragraph 7-12). This simultaneous dual welding step is very difficult to accomplish when manufacturing a membrane contactor (see Sengupta Declaration, Paragraph 14). For example, in Figure 4 of Cho, the dual welding step is where end cap 15 must be simultaneously welded to center tube 12 and shell 13 in order to provide a sealed headspace 28. On the other hand, the second end cap of the instant invention, by providing the second headspace that forces the end cap to communicate with the center tube via the headspace, only has to be attached and sealed at one seal point, the end of the shell. As a result, the instant invention does not require a dual welding step. Thus, eliminating the dual welding step, as required in Figure 4 of Cho and Figure 1 of Kuzumoto, to a single weld of the shell to the end cap allows a membrane contactor to be made more easily. This is clearly an unexpected result of the instant simple

configuration, making the configuration of the instant invention nonobvious.

In sum, the Sengupta Declaration shows that the instant configuration provided an unexpected result by allowing the membrane contactor to be made without the need to simultaneously dual weld (as required by the prior art, see illustrations above) the end caps at two seal locations, the shell and center tube, meaning, the membrane contactor can be made more easily.

The Examiner has not addressed or given any weight to the Sengupta Declaration. Thus, contrary to the MPEP and the case law, the Examiner has failed to weigh the Sengupta Declaration against the latest claims.

Therefore, in view of the remarks above and the evidence of record, the 35 USC § 103(a) rejection of Kuzumoto in view of Cho or Cho in view of Kuzumoto must be removed and independent claims 1, 7, 8, 14 and 19-22 should be allowed.

Furthermore, independent claims 1, 7, 8, and 14 recite, *inter alia*, the additional elements that the shell, first end cap, second

end cap, center tube, first tube sheet, second tube sheet, and plug are "made from a same material." Applicant contends that Cho nor Kuzumoto teach or suggest this element of independent claims 1, 7, 8 and 14.

Applicant notes that contactors may be made of many materials but nowhere does it state that all the materials should or must be the same. Applicant contends that this feature is important because it lends itself to mass production of the module, and therefore, the lowering of the cost to produce the contactor. Additionally, this feature also imparts better physical integrity of the device against: a) temperature fluctuations, and b) solvent induced swelling of components. See Exhibit 1, paragraph 16.

The totality of the record must be considered when determining whether a claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made. Therefore, evidence and arguments directed to advantages not disclosed in the specification cannot be disregarded. *In re Chu*, 66 F.3d 292, 298-99, 36 USPQ2d 1089, 1094-95 (Fed. Cir. 1995).

Cho nor Kuzumoto teach, suggest or provide a "reason" for making a membrane contactor where the shell, end caps, tube sheets,

and center tube are **made from the same material.** Where is that suggestion? Answer, the instant application.

Accordingly, independent claims 1, 7, 8 and 14 should further be allowed.

CONCLUSION

Accordingly, this rejection must be removed and claims 1, 3-8 and 10-22 should be allowed.

B) CLAIMS 1, 3-8 AND 10-22 ARE NON-OBVIOUS UNDER 35 U.S.C. 103(a) OVER ANDERSON IN VIEW OF CHO OR CHO IN VIEW OF ANDERSON

The rejection to all the claims, claims 1, 3-8 and 10-22, under 35 USC § 103(a) for being obvious over Anderson in view of Cho or Cho in view of Anderson, is traversed by the Applicants. The error made by the Examiner is discussed below.

THE QUESTION BEFORE THE BOARD

The only real questions before the board is whether the combination of Anderson with Cho teaches, suggests or provides a "reason" for providing a membrane contactor as claimed in independent claims 1, 7, 8, 14 and 19-22.

DISCUSSION OF THE EXAMINER'S ERROR

MPEP § 2143 "Basic Requirements of a *Prima Facie* Case of Obviousness" states:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine references teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations.

Regarding the third criterion, the court has stated that "to establish *prima facie* obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art." *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Applicant contends that none of the prior art references, Cho nor, Anderson, alone or in combination, teach, suggest or provide a "reason" for making a membrane contactor with all of the claim elements from independent claims 1, 7, 8, 14 and 19-22. More specifically, applicant contends that none of the prior art references, alone or in combination, teach, suggest or provide a reason for making a membrane contactor comprising, among other things, where "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end

cap opening being in communication with said center tube **via said second head space.**"

In other words, Cho nor Anderson teach, suggest or provide a "reason" of making a membrane contactor that has a head space defined by an end cap and a tube sheet that forces the opening in the end cap to communicate with the center tube **via the headspace.** Accordingly, at issue is whether the prior art references teach, suggest or provide a "reason" for making an end cap that communicates with the center tube **via a headspace.** As shown below, the prior art references teach end caps that communicate directly with the center tube and not **via a headspace**, thus, requiring the end caps to be sealed at two locations which requires a dual welding step. See Exhibit 1, Sengupta Declaration

As discussed above, Cho clearly does not teach, suggest or provide a "reason" for making a membrane contactor according to the claimed configuration of the instant invention.

Anderson also does not teach, suggest or provide a "reason" for making a membrane contactor according to the claimed configuration of the instant invention. Anderson teaches a gas separation device adapted for removing contaminants from a feed gas mixture. The device of Anderson, as shown in Figure 3 (see the

below annotated Figure), includes end caps (6 and 7) at each end of the module (30). At the end of the module (30) that communicates with the hollow central tube (37), end cap (7) is provided which has an exit port (15). The opening through the end cap, or exit port (15), communicates directly with the hollow central tube (37). Paragraph 25, Lines 19-22. Consequently, the end cap (7) must be sealed to the module (30) at two locations, the sides of shell (5) (for clarification, see Figures 1 and 2) and the hollow central tube (37). These two sealing locations require a dual welding step that is very difficult to accomplish (see Sengupta Declaration).

See below an annotated Figure 3 of Anderson that illustrates how the end caps of Anderson communicate directly with the center tube and not **via a headspace**, thus, requiring the end caps to be sealed to the module at two locations.

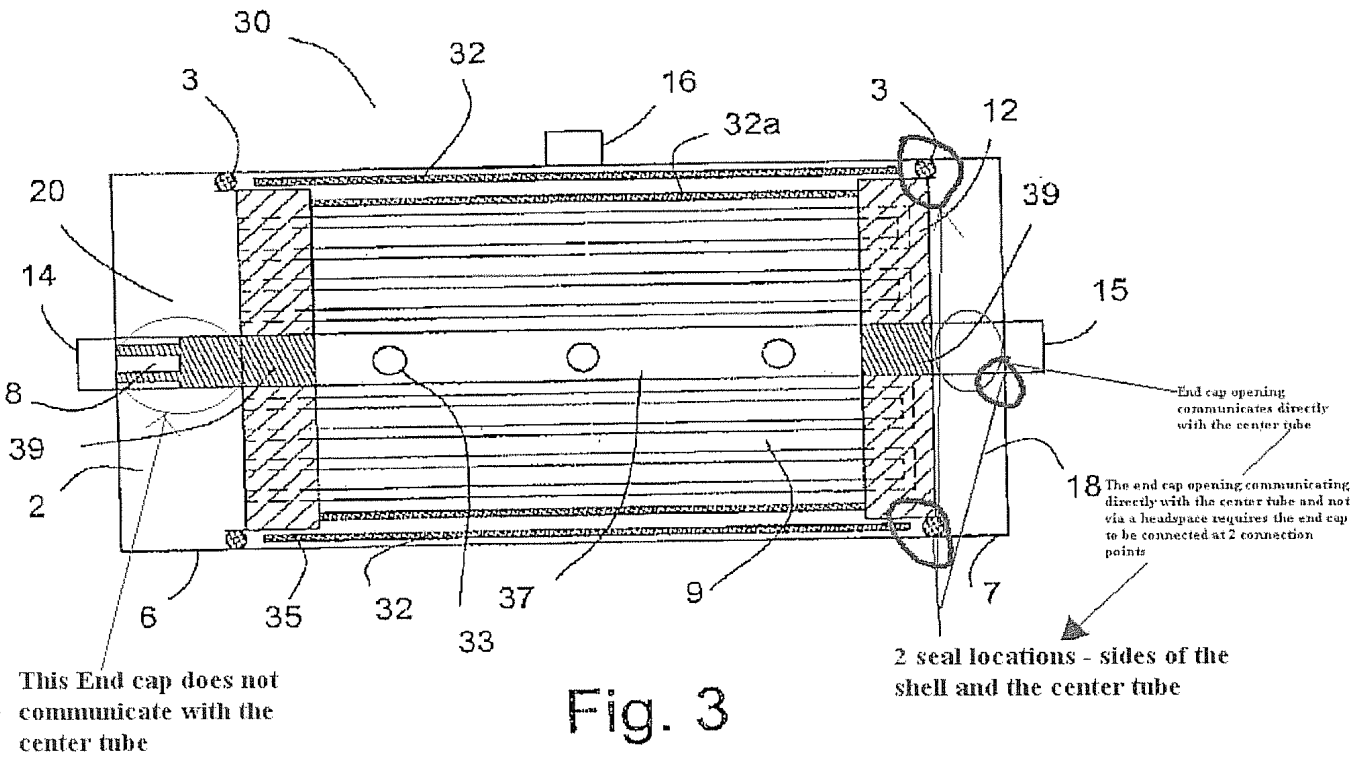


Fig. 3

As a result, the Anderson apparatus does not provide a headspace defined by the end cap and the tube sheet that forces the opening through the end cap to communicate with the center tube **via the headspace.**

Thus, Anderson does not teach, suggest or provide a "reason" for making a membrane contactor comprising, among other things, where "said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween; said second end cap opening being in communication with said center tube **via said second head space.**"

Accordingly, none of the prior art references, Cho, nor Anderson, alone or in combination, teach, suggest or provide a reason for making a membrane contactor with **all** the claim limitations, i.e., a headspace defined by an end cap and a tube sheet that forces the opening of the end cap to communicate with the center tube **via the headspace**.

Where is the suggestion for providing this configuration of a membrane contactor? The answer, as shown above, is nowhere in the prior art. The answer can only be found in the instant application. Therefore, the Examiner has failed to present a *prima facie* case of obviousness and is merely using impermissible hindsight reconstruction.

In addition, this configuration of a membrane contactor with a headspace defined by the end cap and the tube sheet that allows the opening of the end cap to communicate with the center tube **via the headspace**, is not obvious because, as discussed above, it unexpectedly resulted in allowing the membrane contactor to be made more easily. See the previously submitted 132 Declaration by one of the named inventors, Amitava Sengupta.

Therefore, in view of the remarks above and the evidence of record, the 35 USC § 103(a) rejection of Anderson in view of Cho or Cho in view of Anderson must be removed and independent claims 1, 7, 8, 14 and 19-22 should be allowed.

Furthermore, independent claims 1, 7, 8, and 14 recite, *inter alia*, the additional element that the shell, first end cap, second end cap, center tube, first tube sheet, second tube sheet, and plug are "**made from a same material.**" Applicant contends that Anderson and Cho do not teach, suggest or provide a "reason" for the instant invention as presently claimed. As discussed above, this feature is important because it lends itself to mass production of the module, and therefore, the lowering of the cost to produce the contactor. Additionally, this feature also imparts better physical integrity of the device against: a) temperature fluctuations, and b) solvent induced swelling of components. See Exhibit 1, Paragraph 16.

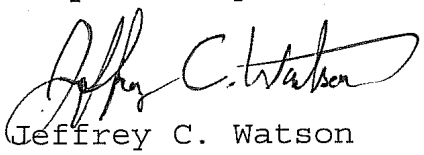
Cho nor Anderson teach, suggest or provide a reason for making the shell, end caps, tube sheets, and center tube **from the same material.** Where is that suggestion? Answer, the instant application.

CONCLUSION

Therefore, in view of the remarks above and the evidence of record, the 35 USC § 103(a) rejection of Anderson in view of Cho or Cho in view of Anderson must be removed and claims 1, 3-8 and 10-22 should be allowed.

In view of the foregoing, Applicant respectfully request that the Board overturns the Examiners rejections and allows claims 1-26 and 29-30.

Respectfully submitted,



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VIII. Claims Appendix

Listing of Claims:

1. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening, and a vacuum being applied via said first end cap opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

2. (canceled)

3. (previously presented) The hollow fiber membrane contactor according to Claim 1, wherein said same material being polyethylene.

4. (original) The hollow fiber membrane contactor according to Claim 1, wherein said shell having a diameter of 4 inches (10 cm) or less.

5. (original) The hollow fiber membrane contactor according to Claim 1, wherein said shell having a length of 24 inches (60 cm) or less.

6. (original) The hollow fiber membrane contactor according to Claim 1, said contactor further comprising a baffle.

7. (previously presented) A system for degassing a liquid comprising:

a liquid under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein said fluid under the elevated pressure being introduced to said contactor via said second end cap opening, said fluid under the elevated pressure being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

8. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

said cartridge comprising:

a perforated center tube having two ends;

a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes, said hollow fiber membranes having a lumen;

tube sheets affixing said fabric to said tube at each said tube end; and

a plug located at one end of said tube;

wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

end caps having an opening therethrough;

said end caps being adjoined to said shell ends;

wherein one of said end caps and said tube sheet next to said plug defining a first head space therebetween where said end cap opening being in communication with said hollow fiber lumens via said first head space;

wherein said other end cap and said other tube sheet defining a second head space therebetween where said end cap opening being in communication with said center tube via said second headspace;

wherein fluid introduced into said contactor via said opening in communication with said center tube being distributed across said hollow fiber fabric and exiting said contactor via said opening through said shell, and a vacuum being applied via said opening in communication with said hollow fiber lumens;

wherein said shell, said end caps, said center tube, said tube sheets, and said plug are made from a same material.

9. (canceled)

10. (previously presented) The hollow fiber membrane contactor according to Claim 8, wherein said same material being polyethylene.

11. (original) The hollow fiber membrane contactor according to Claim 8, wherein said shell having a diameter of 4 inches (10 cm) or less.

12. (original) The hollow fiber membrane contactor according to Claim 8, wherein said shell having a length of 24 inches (60 cm) or less.

13. (original) The hollow fiber membrane contactor according to Claim 8, said contactor further comprising a baffle.

14. (previously presented) A system for introducing a gas into a liquid comprising:

a liquid;

a gas under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein said gas under the elevated pressure being introduced into said hollow fiber lumens via said first end cap opening, and simultaneously said fluid being introduced to said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

15. (previously presented) The hollow fiber membrane contactor according to claim 1 wherein said shell opening being located at a midpoint between said two ends of said shell.

16. (previously presented) The system for degassing a liquid according to claim 7 wherein said shell opening being located at a midpoint between said two ends of said shell.

17. (previously presented) The hollow fiber membrane contactor according to claim 8 wherein said shell opening being located at a midpoint between said two ends of said shell.

18. (previously presented) The system for degassing a liquid according to claim 14 wherein said shell opening being located at a midpoint between said two ends of said shell.

19. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening, and a vacuum being applied via said first cap end opening.

20. (previously presented) A system for degassing a liquid comprising:

a liquid under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein said fluid under the elevated pressure being introduced to said contactor via said second end cap opening, said fluid under the elevated pressure being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening.

21. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

said cartridge comprising:

a perforated center tube having two ends;

a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes, said hollow fiber membranes having a lumen;

tube sheets affixing said fabric to said tube at each said tube end; and

a plug located at one end of said tube;

wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

end caps having an opening therethrough;

said end caps being adjoined to said shell ends;

wherein one of said end caps and said tube sheet next to said plug defining a first head space therebetween where said end cap opening being in communication with said hollow fiber lumens via said first head space;

wherein said other end cap and said other tube sheet defining a second head space therebetween where said end cap opening being in communication with said center tube via said second headspace;

wherein fluid introduced into said contactor via said opening in communication with said center tube being distributed across said hollow fiber fabric and exiting said contactor via said opening through said shell, and a vacuum being applied via said opening in communication with said hollow fiber lumens.

22. (previously presented) A system for introducing a gas into a liquid comprising:

a liquid;

a gas under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

a second end cap having an opening therethrough;

said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween;

said second end cap opening being in communication with said center tube via said second head space;

wherein said gas under the elevated pressure being introduced into said hollow fiber lumens via said first end cap opening, and simultaneously said fluid being introduced to said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening.

IX. Evidence Appendix

1. Declaration of Amitava Sengupta. Submitted pursuant to 37 C.F.R § 132 on December 6, 2006 after a final office action and on January 12, 2007 with a preliminary amendment for an RCE. The Examiner formally considered the declaration in the office action dated January 31, 2007. Attached hereto as Exhibit 1.

X. Related Proceedings Appendix

Date	Proceeding
None	

EXHIBIT 1

CELGARD MEMBRANA
Underlining Performance

Celgard, LLC and
Membrana-Charlotte, A Division of Celgard, LLC

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www.liqui-cel.com

November 27, 2006

Attorney Docket No. 2000.180 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Sengupta, et al Art Unit: 1723

Serial No. 10/812,450 Examiner: Menon, Krishnan S.

Filed: March 30, 2004

For: THREE PORT HIGH PERFORMANCE MINI HOLLOW FIBER MEMBRANE CONTACTOR

DECLARATION UNDER RULE 132

I, Amitava Sengupta, declare:

1. I am a named inventor in the above captioned application.

2. I have a Masters of Technology in Chemical Engineering from the Indian Institute of Technology and a PhD in Chemical Engineering from the Stevens Institute of Technology.

3. I have over 22 years of experience in the manufacture and use of membrane contactors.

4. In the Office Action mailed October 13, 2006, the Examiner states, with regard to Cho et al (US 6,616,841):

> "The core is plugged on one end (by the tube sheet (26), but is not the same end as claimed, which eliminates the 'first' end cap in the reference figure 4. However, this difference in the claims is only an obvious equivalent of the teaching of the reference unless applicant can show otherwise, with evidence."

5. I respectfully disagree with that conclusion. Making a membrane contactor with the center tube plugged at the end where the hollow fiber lumens are open and having the center tube open at the end where the hollow fiber lumens is closed was not obvious to one skilled in the art in view of Cho at the time of filing the instant application.

6. Making a membrane contactor with the center tube plugged at the end where the hollow fiber lumens are open and having the center tube open at the end where the hollow fiber lumens is closed allows a much simpler way to manufacture the membrane contactor and allows the membrane contactor to be made out of the same material. This configuration allows a membrane contactor to be manufactured more simply with a single weld between the end caps and the shell, thus, eliminating the dual welding step of simultaneously welding the edges of the end caps to the shell and welding the end cap to the center tube.

7. Numerous patents have been filed regarding membrane contactors. Many of these patents use different techniques to seal the end caps to the shell and tube sheets. However, none of the patents disclose a membrane contactor that solves the problem of sealing the end caps to the shell by a single welding step.

8. On December 31, 1991 Prasad (US Patent No. 5,264,171) was filed for a method of making spiral wound hollow fiber membrane fabric cartridges and modules having flow-directing baffles. Referring to Figures 17 and 18, Prasad teaches a membrane contactor that uses O-rings for sealing the end caps to the shell and the shell to the tube sheets. (Column 13, Lines 52-61). Prasad does not disclose welding the end caps to the shell by a single welding step.

9. On December 31, 1992 Huang (US Patent No. 5,284,584) was filed for a hollow fiber membrane fabric-containing cartridges and modules having solvent-resistant thermoplastic tube sheets, and methods for making the same. Referring to Figure 6, like Prasad above, Huang teaches a membrane contactor that uses O-rings for sealing the end caps to the shell and the shell to the tube sheets. (Column 21, Lines 58-67). Huang does not disclose welding the end caps to the shell by a single welding step.

10. On December 7, 1998 Carroll (US Patent No. 6,207,053) was filed for a thermoplastic unibody transfer device. Referring to Figure 2, Carroll teaches welding the end cap to the shell using a sealing ring (or weld piece), and to the center tube. (Column 3, Lines 8-13). Because welding between dissimilar materials is more difficult than welding between similar materials, Carroll teaches using the sealing ring, or weld piece, to simplify the welding between the dissimilar materials of the center tube, shell and end caps. (Column 3, Lines 14-24). Carroll requires a dual welding step of simultaneously welding the end caps to the shell (weld 26) and the end cap to the center tube (weld 28). Carroll does not disclose welding the end caps to the shell by a single welding step.

11. On May 8, 2001 Runkle (US Patent Publication No. 2002/0168491) was filed for a hollow fiber membrane contactor and method for making the same. Runkle teaches a membrane contactor with a first potting step for sealing the tube sheets to the shell and a second potting step for sealing the end caps to the shell and tube sheets. (Paragraphs 20-29). Runkle teaches using a dual potting technique for sealing the end caps to the shell, thus, Runkle does not disclose welding the end caps to the shell by a single welding step.

12. On June 21, 2001 Cho (US Patent No. 6,616,841) was filed for a hollow fiber membrane contactor. Cho is directed toward making a hollow fiber membrane contactor with a polymethyl pentene (PMP) hollow fiber. (Column 2, Lines 8-29). Cho is not directed and makes no mention of seals or welds between the end caps and the shell. As illustrated in Figures 1, 3 and 4, Cho shows different configurations of membrane contactors that all require a dual welding step. Thus, Cho does not disclose welding the end caps to the shell by a single welding step.

13. My experience leading up the instant invention tells me that a person skilled in the art of membrane contactors would not look to Cho for solving the problem of sealing the end caps to the shell with a single welding step.

14. The dual welding step, required prior to the instant invention, was difficult to accomplish because the extremely tight dimensional tolerances needed to thermally weld at two different locations simultaneously are hard to achieve, as anyone skilled in the art can attest, leading to low product yield. The dual-welding technique used for membrane contactor designs used prior to the instant invention, as illustrated in Carroll, Runkle, and Cho, require one 'butt'-welding at one location (between the end cap and the shell) and a second 'butt' or 'lap'-welding at the other

location (between the end cap and the center tube). The welding may be perfect between the end cap and the shell but insufficient between the end cap and the center tube, and vice versa. It has been my experience that such dual-welded membrane contactors often fail in the field at one or the other weld locations when subjected to extremes of temperatures, to high pressures, and to organic solvents that cause swelling in the polymeric components.

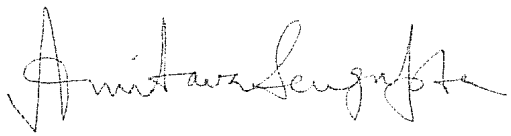
15. Eliminating the dual welding step required previously in membrane contactors, allowed the shell, end caps, tube sheets and plug to be made out of the same material.

16. Making the shell, end caps, tube sheets and plug of a membrane contactor out of the same material unexpectedly resulted in the membrane contactor obtaining better physical integrity of the device against temperature fluctuations, and solvent induced swelling of components. When the end cap and the shell wall are of the same material, a thermal welding produces a completely uniform joint, with the two welded components inter-melted together and there being no sign of any phase boundaries. This makes the entire finished product as if it was made from a single component and a finished product made from a single mold or machined from a single component is much stronger than a finished product that is made by attaching components of dissimilar materials.

17. Therefore, I must disagree with the Examiner's conclusion repeated above in Paragraph 4. Making a membrane contactor with the center tube plugged at the end where the hollow fiber lumens are open and having the center tube open at the end where the hollow fiber lumens is closed, allowing a single weld between the end caps and the shell, thus, allowing the shell, end caps, tube sheets and plug of a membrane contactor to be made out of the same material is not obvious.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,



Amitava Sengupta

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